

# AERO CET SAMPLE PAPER (1) 2023



# PHYSICS

1. A light source, which emits two wavelengths  $\lambda_1 = 400 \text{ nm}$  and  $\lambda_2 = 600 \text{ nm}$ , is used in a Young's double slit experiment. If recorded fringe widths for  $\lambda_1$  and  $\lambda_2$  are  $\beta_1$  and  $\beta_2$  and number of fringes for them within a distance  $y$  on one side of the central maximum are  $m_1$  and  $m_2$ , respectively, then

- A)  $\beta_2 > \beta_1$
- B)  $m_1 > m_2$
- C) From the central maximum, 3<sup>rd</sup> maximum of  $\lambda_2$  overlaps with 5<sup>th</sup> minimum of  $\lambda_1$
- D) The angular separation of fringes for  $\lambda_1$  is greater than  $\lambda_2$

**ANS: (A), (B) and (C)**

2. One end of a taut string of length 3m along the x axis is fixed at  $x=0$ . The speed of the waves in the string is  $100 \text{ m/s}$ . The other end of the string is vibrating in the y direction so that stationary waves are set up in the string. The possible waveform(s) of these stationary waves is(are)

- A)  $y = A \sin \frac{\pi x}{3} \cos 50\pi t$
- B)  $y = A \sin \frac{\pi x}{3} \cos 100\pi t$
- C)  $y = A \sin 5\pi x \cos 250\pi t$
- D)  $y = A \sin 5\pi x \cos 250\pi t$

**ANS: (A), (C) and (D)**

3. Let  $E_1(r)$ ,  $E_2(r)$  and  $E_3(r)$  be the respective electric fields at a distance  $r$  from a point charge  $Q$ , an infinitely long wire with constant linear charge density  $\lambda$ , and an infinite plane with uniform surface charge density  $\sigma$ . If  $E_1(r_0) = E_2(r_0) = E_3(r_0)$  at a given distance  $r_0$ , then

- A)  $Q = 4\sigma r_0^2$
- B)  $r_0 = \frac{\lambda}{2\pi\sigma}$
- C)  $E_1(r_0/2) = 2E_2(r_0/2)$
- D)  $E_2(r_0/2) = 4E_3(r_0/2)$

**ANS: (C)**

4. Heater of an electric kettle is made of a wire of length  $L$  and diameter  $d$ . It takes 4 minutes to raise the temperature of  $0.5 \text{ kg}$  water by  $40 \text{ K}$ . This heater is replaced by a new heater having two wires of the same material, each of length  $L$  and diameter  $2d$ . The way these wires are connected is given in the options. How much time in minutes will it take to raise the temperature of the same amount of water by  $40 \text{ K}$ ?

- A) 4 if wires are in parallel
- B) 2 if wires are in series
- C) 1 if wires are in series
- D) 0.5 if wires are in parallel

**ANS: (B) and (D)**

5. Two coherent sources produce waves of different intensities which interfere. After interference, the ratio of the maximum intensity to the minimum intensity is 16. The intensity of the waves are in the ratio:

- A) 4: 1
- B) 25: 9
- C) 16: 9
- D) 5: 3

**ANS: (B)**

6. Mobility of electrons in a semiconductor is defined as the ratio of their drift velocity to the applied electric field.

If, for an n-type semiconductor, the density of electrons is  $10^{19} \text{ m}^{-3}$  and their mobility is  $1.6 \text{ m}^2/(\text{V.s})$  then the resistivity of the semiconductor (since it is an n-type semiconductor contribution of holes is ignored) is close to:

- A)  $2 \Omega \text{m}$
- B)  $0.4 \Omega \text{m}$
- C)  $4 \Omega \text{m}$
- D)  $0.2 \Omega \text{m}$

**ANS: (B)**

7. A sample of radioactive material A, that has an activity of 10 mCi ( $1 \text{ Ci} = 3.7 \times 10^{10} \text{ decays/s}$ ), has twice the number of nuclei as another sample of a different radioactive material B which has an activity of 20 mCi. The correct choices for half-lives of A and B would then be respectively:

- A) 20 days and 5 days
- B) 20 days and 10 days
- C) 5 days and 10 days
- D) 10 days and 40 days

**ANS. (A)**

8. A convex lens is put 10 cm from a light source and it makes a sharp image on a screen, kept 10 cm from the lens. Now a glass block (refractive index 1.5) of 1.5 cm thickness is placed in contact with the light source. To get the sharp image again, the screen is shifted by a distance d. Then d is:

- A) 0.55 cm away from the lens
- B) 1.1 cm away from the lens
- C) 0.55 cm towards the lens
- D) 0

**ANS: (A)**

9. Two plane mirrors are inclined to each other such that a ray of light incident on the first mirror (M1) and parallel to the second mirror (M2) is finally reflected from the second mirror (M2) parallel to the first mirror (M1). The angle between the two mirrors will be:

- A)  $90^\circ$
- B)  $45^\circ$
- C)  $75^\circ$
- D)  $60^\circ$

**ANS: (D)**

10. In a Young's double slit experiment, the slits are placed 0.320 mm apart. Light of wavelength  $\lambda = 500 \text{ nm}$  is incident on the slits. The total number of bright fringes that are observed in the angular range  $-30^\circ \leq \theta \leq 30^\circ$  is:

- A) 320
- B) 641
- C) 321
- D) 640

**ANS: (B)**

11. A rod of mass 'M' and length '2L' is suspended at its middle by a wire. It exhibits torsional oscillations; if two masses each of 'm' are attached at distance 'L/2' from its center on both sides, it reduces the oscillation frequency by 20%. The value of ratio m/M is close to:

- A) 0.17
- B) 0.37
- C) 0.57

D) 0.77

**ANS: (B)**

12. A 15 g mass of nitrogen gas is enclosed in a vessel at a temperature 27°C. Amount of heat transferred to the gas, so that rms velocity of molecules is doubled, is about:  
[Take  $R = 8.3 \text{ J/K mole}$ ]

A) 10 k

B) 0.9 kJ

C) 6 kJ

D) 14 Ki

**ANS: (A)**

13. In a communication system operating at wavelength 800 nm, only one percent of source frequency is available as signal bandwidth. The number of channels accommodated for transmitting TV signals of band width 6 MHz are (Take velocity of light  $c = 3 \times 10^8 \text{ m/s}$ ,  $h = 6.6 \times 10^{-34} \text{ J-s}$ )

A)  $3.75 \times 10^6$

B)  $4.87 \times 10^5$

C)  $3.86 \times 10^6$

D)  $6.25 \times 10^5$

**ANS: (D)**

14. The energy required to take a satellite to a height 'h' above Earth surface (radius of Earth =  $6.4 \times 10^3 \text{ km}$ ) is  $E_1$  and kinetic energy required for the satellite to be in a circular orbit at this height is  $E_2$ . The value of h for which  $E_1$  and  $E_2$  are equal, is:

A)  $1.28 \times 10^4 \text{ km}$

B)  $6.4 \times 10^3 \text{ km}$

C)  $3.2 \times 10^3 \text{ k}$

D)  $1.6 \times 10^3 \text{ km}$

**ANS: (C)**

15. A series AC circuit containing an inductor (20 mH), a capacitor (120  $\mu\text{F}$ ) and a resistor (60  $\Omega$ ) is driven by an AC source of 24 V/50 Hz. The energy dissipated in the circuit in 60 s is:

A)  $2.26 \times 10^3 \text{ J}$

B)  $3.39 \times 10^3 \text{ J}$

C)  $5.65 \times 10^2 \text{ J}$

D)  $5.17 \times 10^2 \text{ J}$

**ANS: (D)**

16. The magnetic field associated with a light wave is given, at the origin, by  $B = B_0 [\sin(3.14 \times 10^7) ct + \sin(6.28 \times 10^7) ct]$ . If this light falls on a silver plate having a work function of 4.7 eV, what will be the maximum kinetic energy of the photo electrons?  
( $c = 3 \times 10^8 \text{ ms}^{-1}$ ,  $h = 6.6 \times 10^{-34} \text{ J-s}$ )

A) 7.72 eV

B) 8.52 eV

C) 12.5 eV

D) 6.82 eV

**ANS: (A)**

17. Two forces P and Q of magnitude 2F and 3F, respectively, are at an angle  $\theta$  with each other. If the force Q is doubled, then their resultant also gets doubled. Then, the angle is:

- A)  $30^\circ$
- B)  $60^\circ$
- C)  $90^\circ$
- D)  $120^\circ$

**ANS: (D)**

**18.** The self-induced emf of a coil is 25 volts. When the current in it is changed at uniform rate from 10 A to 25 A in 1s, the change in the energy of the inductance is:

- A) 437.5 J
- B) 637.5 J
- C) 740 J
- D) 540 J

**ANS: (A)**

**19.** A current of 2 mA was passed through an unknown resistor which dissipated a power of 4.4 W. Dissipated power when an ideal power supply of 11V is connected across it is:

- A)  $11 \times 10^{-5}$  W
- B)  $11 \times 10^{-4}$  W
- C)  $11 \times 10^5$  W
- D)  $11 \times 10^{-3}$  W

**ANS: (A)**

**20.** The diameter and height of a cylinder are measured by a meter scale to be  $12.6 \pm 0.1$  cm and  $34.2 \pm 0.1$  cm, respectively. What will be the value of its volume in appropriate significant figures?

- A)  $4260 \pm 80$  cm<sup>3</sup>
- B)  $4300 \pm 80$  cm<sup>3</sup>
- C)  $4264.4 \pm 81.0$  cm<sup>3</sup>
- D)  $4264 \pm 81$  cm<sup>3</sup>

**ANS: (A)**

**21.** At some location on earth the horizontal component of earth's magnetic field is  $18 \times 10^{-6}$  T. At this location, magnetic needle of length 0.12 m and pole strength 1.8 Am is suspended from its mid-point using a thread, it makes  $45^\circ$  angle with horizontal in equilibrium. To keep this needle horizontal, the vertical force that should be applied at one of its ends is:

- A)  $3.6 \times 10^{-5}$  N
- B)  $6.5 \times 10^{-5}$  N
- C)  $1.3 \times 10^{-5}$  N
- D)  $1.8 \times 10^{-5}$  N

**ANS: (B)**

**22.** The modulation frequency of an AM radio station is 250 kHz, which is 10% of the carrier wave. If another AM station approaches you for license what broadcast frequency will you allot?

- A) 2750 kHz
- B) 2000 kHz
- C) 2250 kHz
- D) 2900 kHz

**ANS: (B)**

**23.** Consider the nuclear fission  $\text{Ne}_{20} \rightarrow 2\text{He}_4 + \text{C}_{12}$  Given that the binding energy/nucleon of Ne<sub>20</sub>, He<sub>4</sub> and C<sub>12</sub> are, respectively, 8.03 MeV, 7.07 MeV and 7.86 MeV, identify the correct statement:

- A) 8.3 MeV energy will be released
- B) Energy of 12.4 MeV will be supplied

- C) Energy of 11.9 MeV has to be supplied
- D) Energy of 3.6 MeV will be released

**ANS: (C)**

**24.** Half mole of an ideal monoatomic gas is heated at constant pressure of 1atm from 20 °C to 90°C. Work done by gas is close to: (Gas constant  $R = 8.31 \text{ J/mol.K}$ )

- A) 73 J
- B) 291 J
- C) 581 J
- D) 146 J

**ANS: (B)**

**25.** The eye can be regarded as a single refracting surface. The radius of curvature of this surface is equal to that of cornea (7.8 mm). This surface separates two media of refractive indices 1 and 1.34. Calculate the distance from the refracting surface at which a parallel beam of light will come to focus.

- A) 2 cm
- B) 1 cm
- C) 3.1 cm
- D) 4.0 cm

**ANS: (C)**

# CHEMSITRY

1. Extra pure  $N_2$  can be obtained by heating

- A)  $NH_3$  with  $CuO$
- B)  $NH_4NO_3$
- C)  $(NH_4)_2Cr_2O_7$
- D)  $Ba(N_3)_2$

**ANS: (D)**

2. Geometrical shapes of the complexes formed by the reaction of  $Ni^{2+}$  with  $Cl^-$ ,  $CN^-$  and  $H_2O$ , respectively, are

- A) Octahedral, tetrahedral and square planar
- B) Tetrahedral, square planar and octahedral
- C) Square planar, tetrahedral and octahedral
- D) Octahedral, square planar and octahedral

**ANS: (B)**

3. The color of light absorbed by aqueous solution of  $CuSO_4$  is

- A) Orange, red
- B) Blue, Green
- C) Yellow
- D) Violet

**ANS: (A)**

4. Dissolving 120 g of urea (mol. wt. 60) in 1000 g of water gave a solution of density 1.15 g/mL. The molarity of the solution is

- A) 1.78 M
- B) 2.00 M
- C) 2.05 M
- D) 2.22 M

**ANS: (C)**

5. Among the following compounds, the most acidic is

- A) p-nitrophenol
- B) p-hydroxybenzoic acid
- C) o-hydroxybenzoic acid
- D) p-toluic acid

**ANS: (C)**

6. Extraction of metal from the ore cassiterite involves

- A) Carbon reduction of an oxide ore
- B) Self-reduction of a sulphide ore
- C) Removal of copper impurity
- D) Removal of iron impurity

**ANS: (A), (D)**

7. The correct statement(s) pertaining to the adsorption of a gas on a solid surface is (are)

- A) Adsorption is always exothermic
- B) Physisorption may transform into chemisorption at high temperature
- C) Physisorption increases with increasing temperature but chemisorption decreases with increasing temperature
- D) Chemisorption is more exothermic than physisorption, however it is very slow due to higher energy of activation

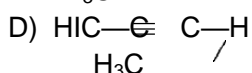
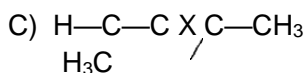
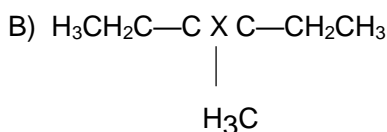
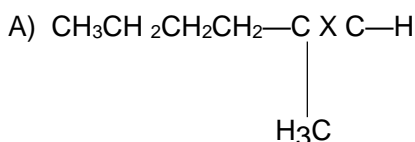
**ANS: (A), (B) and (D)**

8. According to kinetic theory of gases

- A) Collisions are always elastic
- B) Heavier molecules transfer more momentum to the wall of the container
- C) Only a small number of molecules have very high velocity
- D) Between collisions, the molecules move in straight lines with constant velocities

**ANS: (A), (C) and (D)**

9. The structure of compound P is



**ANS: (D)**

10. Choose the correct reason(s) for the stability of the **lyophobic** colloidal particles

- A) Preferential adsorption of ions on their surface from the solution
- B) Preferential adsorption of solvent on their surface from the solution
- C) Attraction between different particles having opposite charges on their surface
- D) Potential difference between the fixed layer and the diffused layer of opposite charges around the colloidal particles

**ANS: (A), (D)**

11. Which of the following hydrogen halides react(s) with  $\text{AgNO}_3$  (aq) to give a precipitate that dissolves in  $\text{Na}_2\text{S}_2\text{O}_3$  (aq)?

- A) HCl



- B) HF
- C) HBr
- D) HI

**ANS: (A), (C), (D)**

**12.** Copper is purified by electrolytic refining of blister copper. The correct statement(s) about this process is (are)

- A) Impure Cu strip is used as cathode
- B) Acidified aqueous  $\text{CuSO}_4$  is used as electrolyte
- C) Pure Cu deposits at cathode
- D) Impurities settle as anode-mud

**ANS: (B), (C) and (D)**

**13.** Hydrogen bonding plays a central role in the following phenomena:

- A) Ice floats in water
- B) Higher Lewis basicity of primary amines than tertiary amines in aqueous solutions
- C) Formic acid is more acidic than acetic acid
- D) Dimerization of acetic acid in benzene

**ANS: (A), (B) and (D)**

**14.** In a galvanic cell, the salt bridge

- A) Does not participate chemically in the cell reaction
- B) Stops the diffusion of ions from one electrode to another
- C) is necessary for the occurrence of the cell reaction
- D) Ensures mixing of the two electrolytic solutions

**ANS: (A), (C) or only (A)**

**15.** Upon heating with  $\text{Cu}_2\text{S}$ , the reagent(s) that give copper metal is/are

- A)  $\text{CuFeS}_2$
- B)  $\text{CuO}$
- C)  $\text{Cu}_2\text{O}$
- D)  $\text{CuSO}_4$

**ANS: (B), (C) and (D)**

**16.** The correct statement(s) for orthoboric acid is/are

- A) It behaves as a weak acid in water due to self-ionization
- B) Acidity of its aqueous solution increases upon addition of ethylene glycol
- C) It has a three dimensional structure due to hydrogen bonding
- D) It is a weak electrolyte in water

**ANS: (B) and (D)**

**17.** Oxidation states of the metal in the minerals haematite and magnetite, respectively are

- A) I, III in haematite and III in magnetite
- B) II, III in haematite and II in magnetite
- C) II in haematite and II, III in magnetite
- D) III in haematite and II, III in magnetite

**ANS: (D)**

18. Among the following complexes (K-P),  $K_3[Fe(CN)_6]$ (K),  $[Co(NH_3)]C_3$ (L),  $Na_3[Co(oxalate)_3]$ (M),  $[Ni(H_2O)_6]Cl_2$ (N),  $K_2[Pt(CN)_4]$ (O) and  $[Zn(H_2O)_6](NO_3)_2$ (P) The diamagnetic complexes are

- A) K, L, M, N
- B) K, M, O, P
- C) L, M, O, P
- D) L, M, N, O

**ANS: (C)**

19. Passing  $H_2S$  gas into a mixture of  $Mn^{2+}$ ,  $Ni^{2+}$ ,  $Cu^{2+}$ , and  $Hg^{2+}$  ions in an acidified aqueous solution precipitates

- A)  $CuS$  and  $HgS$
- B)  $MnS$  and  $CuS$
- C)  $MnS$  and  $NiS$
- D)  $NiS$  and  $HgS$

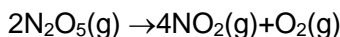
**ANS: (A)**

20. Reduction of the metal centre in aqueous permanganate ion involves

- A) 3 electrons in neutral medium
- B) 5 electrons in neutral medium
- C) 3 electrons in alkaline medium
- D) 5 electrons in acidic medium

**ANS: (A), (C) and (D)**

21. For the first order reaction



- A) The concentration of the reactant decreases exponentially with time.
- B) The half-life of the reaction decreases with increasing temperature.
- C) The half-life of the reaction depends on the initial concentration of the reactant.
- D) The reaction proceeds to 99.6% completion in eight half-life duration

**ANS: (A), (B) and (D)**

22. The equilibrium



In aqueous medium at  $25^\circ C$  shifts towards the left in the presence of

- A)  $NO_3^-$
- B)  $Cl^-$
- C)  $SCN^-$
- D)  $CN^-$

**ANS: (B), (C) and (D)**

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**25.** Upon heating with  $\text{Cu}_2\text{S}$ , the reagent(s) that give copper metal is/are

A)  $\text{CuFeS}_2$

B)  $\text{CuO}$

C)  $\text{Cu}_2\text{O}$

D)  $\text{Cu}_2\text{O}$

**ANS: (B), (C) and (D)**

# MATHEMATICS

1. Consider three observations  $a$ ,  $b$  and  $c$  such that  $b = a+c$ . If the standard deviation of  $a+2$ ,  $b+2$ ,  $c+2$  is  $d$ , then which of the following is true?

- A)  $b^2 = a^2 + c^2 + 3d^2$
- B)  $b^2 = 3(a^2 + c^2) - 9d^2$
- C)  $b^2 = 3(a^2 + c^2) + 9d$
- D)  $b^2 = 3(a^2 + c^2 + d^2)$

**ANS: (B)**

2. A pack of cards has one card missing. Two cards are drawn randomly and are found to be spades. The probability that the missing card is not a spade, is:

- A)  $3/4$
- B)  $52/867$
- C)  $39/50$
- D)  $22/425$

**ANS: (C)**

3. The number of elements in the set  $\{x \in \mathbb{R} : (|x| + 3) |x+4| = 6\}$  is equal to:

- A) 2
- B) 1
- C) 3
- D) 4

**ANS: (A)**

4. If for  $a > 0$ , the feet of perpendiculars from the points  $A(a, -2a, 3)$  and  $B(0, 4, 5)$  on the plane  $lx + my + nz = 0$  are points  $C(0, -a, -1)$  and  $D$  respectively, then the length of line segment  $CD$  is equal to

- A)  $\sqrt{41}$
- B)  $\sqrt{55}$
- C)  $\sqrt{31}$
- D)  $\sqrt{66}$

**ANS: (D)**

5. If  $y=y(x)$  is the solution of the differential equation,  $dy/dx + 2y \tan x = \sin x$ ,  $y(\pi/3) = 0$  then the maximum value of the function  $y(x)$  over  $\mathbb{R}$  is equal to:

- A) 8
- B)  $1/2$
- C)  $-15/4$
- D)  $1/8$

**ANS: (D)**

6. Which of the following Boolean expression is a tautology?

- A)  $(p \wedge q) \wedge (p \rightarrow q)$
- B)  $(p \wedge q) \vee (p \vee q)$
- C)  $(p \wedge q) \vee (p \rightarrow q)$
- D)  $(p \wedge q) \rightarrow (p \rightarrow q)$

**ANS: (D)**

7. Let  $f: S \rightarrow S$  where  $S = (0, \infty)$  be a twice differentiable function such that  $f(x+1) = xf(x)$ . If  $g: S \rightarrow R$  be defined as  $g(x) = \log_e f(x)$ , then the value of  $|g''(5) - g''(1)|$  is equal to:

- A) 197/144
- B) 187/144
- C) 205/144
- D) 1

**ANS: (C)**

8. If  $y = y(x)$  is the solution of the differential equation

$\frac{dy}{dx} + (\tan x) y = \sin x$ ,  $0 \leq x \leq \frac{\pi}{3}$ , with  $y(0) = 0$ , then  $y\left(\frac{\pi}{4}\right)$  equal to:

- A)  $\log_e 2$
- B)  $\frac{1}{2} \log_e 2$
- C)  $\left(\frac{1}{\sqrt[2]{2}}\right) \log_e 2$
- D)  $\frac{1}{4} \log_e 2$

**ANS: (C)**

9. If the foot of the perpendicular from point  $(4, 3, 8)$  on the line  $L1: \frac{x-a}{l} = \frac{y-2}{3} = \frac{z-b}{4}$ ,  $l \neq 0$

$(3, 5, 7)$ , then the shortest distance between the line  $L1$  and line  $L2: \frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$  is equal to:

- A)  $\sqrt{\frac{2}{3}}$
- B)  $\frac{1}{\sqrt{3}}$
- C)  $\frac{1}{2}$
- D)  $\frac{1}{\sqrt{6}}$

**ANS: (D)**

10. Let  $A(-1, 1)$ ,  $B(3, 4)$  and  $C(2, 0)$  be given three points. A line  $y = mx$ ,  $m > 0$ , intersects lines  $AC$  and  $BC$  at point  $P$  and  $Q$  respectively. Let  $A_1$  and  $A_2$  be the areas of  $\triangle ABC$  and  $\triangle PQC$  respectively, such that  $A_1 = 3A_2$ , then the value of  $m$  is equal to:

- A)  $\frac{4}{15}$
- B) 1
- C) 2
- D) 3

**ANS: (B)**

11. Let A denote the event that a 6-digit integer formed by 0, 1, 2, 3, 4, 5, 6 without repetitions, be divisible by 3. Then probability of event A is equal to:

- A)  $\frac{4}{9}$
- B)  $\frac{9}{56}$
- C)  $\frac{3}{7}$
- D)  $\frac{11}{27}$

**ANS: (A)**

12. Consider a rectangle ABCD having 5, 7, 6, 9 points in the interior of the line segments AB, CD, BC, DA respectively. Let  $\alpha$  be the number of triangles having these points from different sides as vertices and  $\beta$  be the number of quadrilaterals having these points from different sides as vertices. Then  $(\beta - \alpha)$  is equal to:

- A) 1890
- B) 795
- C) 717
- D) 1173

**ANS: (C)**

13. Let C be the locus of the mirror image of a point on the parabola  $y^2 = 4x$  with respect to the line  $y = x$ . Then the equation of tangent to C at P(2, 1) is:

- A)  $2x + y = 5$
- B)  $x + 2y = 4$
- C)  $x + 3y = 5$
- D)  $x - y = 1$

**ANS: (D)**

14. Let  $A = \{2, 3, 4, 5, \dots, 30\}$  and ' $\cong$ ' be an equivalence relation on  $A \times A$ , defined by  $(a, b) \cong (c, d)$ , if and only if  $ad = bc$ . Then the number of ordered pairs which satisfy this equivalence relation with ordered pair (4, 3) is equal to:

- A) 7
- B) 5
- C) 6
- D) 8

**ANS: (A)**

15. Let the lengths of intercepts on x-axis and y-axis made by the circle  $x^2 + y^2 + ax + 2ay + c = 0$ , ( $a < 0$ ) be  $2\sqrt{2}$  and  $2\sqrt{5}$ , respectively. Then the shortest distance from origin to a tangent to this circle which is perpendicular to the line  $x + 2y = 0$ , is equal to:

- A)  $\sqrt{10}$
- B)  $\sqrt{6}$
- C)  $\sqrt{11}$
- D)  $\sqrt{7}$

**ANS: (B)**

16. If the Boolean expression  $(p \wedge q) * (p \otimes q)$  is a tautology, then  $*$  and  $\otimes$  are respectively given by:

- A)  $\wedge, \rightarrow$
- B)  $\rightarrow, \rightarrow$
- C)  $\vee, \rightarrow$
- D)  $\wedge, \vee$

**ANS: (B)**

**17.** If the sides AB, BC, and CA of a triangle ABC have, 3, 5 and 6 interior points respectively, then the total number of triangles that can be constructed using these points as vertices, is equal to:

- A) 360
- B) 240
- C) 333
- D) 364

**ANS: (C)**

**18.** The number of integral values of m so that the abscissa of point of intersection of lines  $3x + 4y = 9$  and  $y = mx + 1$  is also an integer, is:

- A) 3
- B) 2
- C) 1
- D) 0

**ANS: (B)**

**19.** The sum of all the 4-digit distinct numbers that can be formed with the digits 1, 2, 2 and 3 is:

- A) 26664
- B) 122664
- C) 122234
- D) 22264

**ANS: (A)**

**20.** Choose the correct statement about two circles whose equations are given below:

$$x^2 + y^2 - 10x - 10y + 41 = 0$$

$$x^2 + y^2 - 22x - 10y + 137 = 0$$

- A) Circles have no meeting point
- B) Circles have two meeting points
- C) Circles have only one meeting point
- D) Circles have same centre

**ANS: (C)**

**21.** For all four circles M, N, O and P, following four equations are given:

Circle M:  $x^2 + y^2 = 1$

Circle N:  $x^2 + y^2 - 2x = 0$

Circle O:  $x^2 + y^2 - 2x - 2y + 1 = 0$

Circle P:  $x^2 + y^2 - 2y = 0$

If the centre of circle M is joined with centre of the circle N, further centre of circle N is joined with centre of the circle O, centre of circle O is joined with the centre of circle P and lastly, centre of circle P is joined with centre of circle M, then these lines form the sides of a:

- A) Rectangle
- B) Square
- C) Parallelogram
- D) Rhombus

**ANS: (B)**

**22.** The equations of one of the straight lines which passes through the point (1, 3) and makes an angle  $\tan^{-1}(\sqrt{2})$  with the straight line,  $y+1 = 3\sqrt{2}x$  is:

- A)  $5\sqrt{2}x + 4y - (15 + 4\sqrt{2}) = 0$
- B)  $4\sqrt{2}x - 5y - (5 + 4\sqrt{2}) = 0$
- C)  $4\sqrt{2}x + 5y - 4\sqrt{2} = 0$
- D)  $4\sqrt{2}x + 5y - 15 + 4\sqrt{2} = 0$

**ANS: (D)**

**23.** Let in a series of  $2n$  observations, half of them are equal to  $a$  and remaining half are equal to  $-a$ . Also by adding a constant  $b$  in each of these observations, the mean and standard deviation of new set become 5 and 20, respectively. Then the value of  $a^2 + b^2$  is equal to:

- A) 250
- B) 925
- C) 650
- D) 425

**ANS: (D)**

**24.** Let  $S_1$  be the sum of first  $2n$  terms of an arithmetic progression. Let  $S_2$  be the sum of first  $4n$  terms of the same arithmetic progression. If  $(S_2 - S_1)$  is 1000, then the sum of the first  $6n$  terms of the arithmetic progression is equal to:

- A) 3000
- B) 7000
- C) 5000
- D) 1000

**ANS: (A)**

**25.** Define a relation  $R$  over a class of  $n \times n$  real matrices  $A$  and  $B$  as “ $ARB$  if there exists a non-singular matrix  $P$  such that  $PAP^{-1} = B$ ” The which of the following is true?

- A)  $R$  is reflexive, symmetric but not transitive
- B)  $R$  is symmetric, transitive but not reflexive,
- C)  $R$  is an equivalence relation
- D)  $R$  is reflexive, transitive but not symmetric

**ANS: (C)**





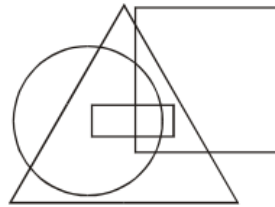
# APPTITUDE

## LOGICAL VENN DIAGRAMS

This Section deals with questions which aim at analyzing a candidate's ability to relate a certain given group of items and illustrate it diagrammatically. In these tests a relationship is to be established between two or more items represented by diagrams. The items represented by the diagrams may be individual, a particular group/class of people etc.

1. Study the following diagram carefully and answer the questions the follow:

- ☐ Government employees
- Urban people
- Graduates
- Teachers



➡ Which of the following statements is true?

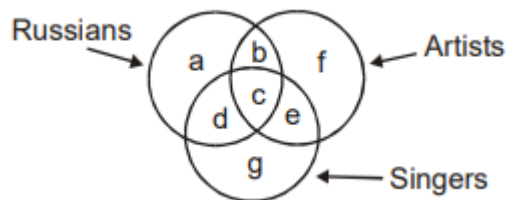
- A) All urbans are graduates
- B) All graduates are urbans
- C) All the urban government employees are graduates
- D) All teachers are urban people

**ANS: (D)**

2. In the following diagram there are three intersecting circles each representing certain sections of people. Different regions are marked a-g. Read the statements in question and choose the letter of the region which correctly represents the statements?

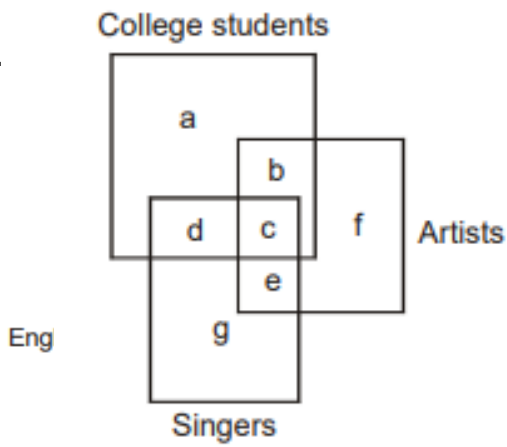
➡ Russians who are artists but not singers.

- A) b
- B) c
- C) b
- D) g

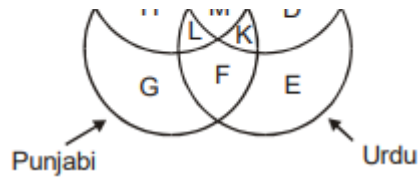


**ANS: (C)**

3.



→



College students who are artists but not singers are represented

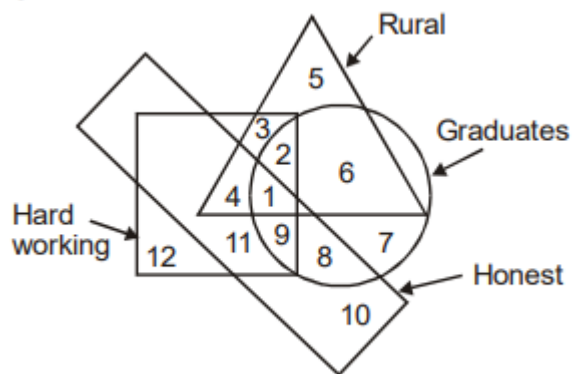
by:

- A) a
- B) b
- C) f

D) e

**ANS: (B)**

4.



Graduates, hardworking and honest rural people are indicated?

→

- A) 1
- B) 2
- C) 3
- D) 4

**ANS: (A)**

5. There are four intersecting circles in the following diagram, each representing people who can read and write English, Hindi, Urdu and Punjabi.

$$A = 40 \quad C = 2A \quad E = \frac{1}{2} A \quad G = 2E$$

People who can read and write Hindi, Urdu, and Punjabi are represented by?

- A) a
- B) d
- C) k
- D) e

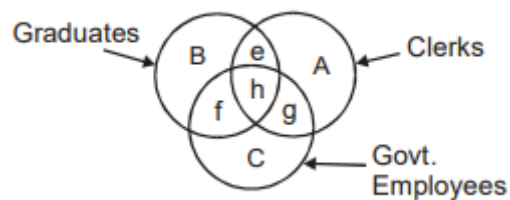
**ANS: (C)**

- **6.** Three circles representing GRADUATES, CLERKS and GOVERNMENT EMPLOYEES are intersecting one another. They intersecting one another. The intersections are marked A,B,C,e,f,g, and h. Which part best represents the statements in questions.

Some Clerks are graduates.

- A) e
- B) h
- C) g
- D) f

**ANS: (A)**

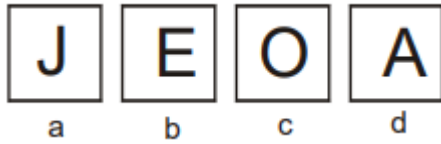


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## Multiple Choice Questions

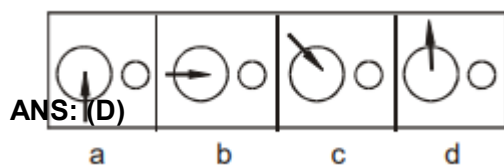
7. In the given four figures, three of them are similar in some respect, while one is different. Out of the four figures select the figure which is different.

Odd One Out



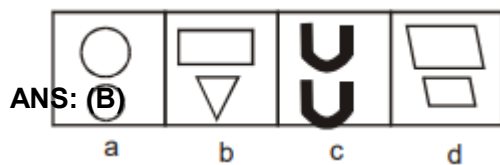
ANS: (A)

8. Odd One Out



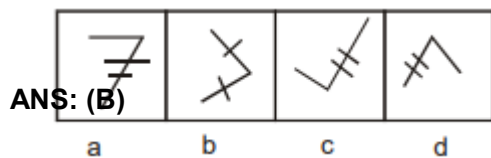
ANS: (D)

9. Odd One Out



ANS: (B)

10. Odd One Out



ANS: (B)

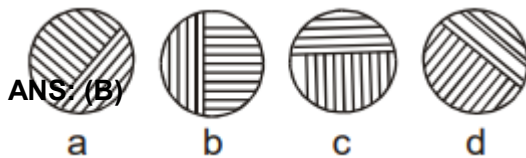
## Lateral Inversion

11. In the following questions, a figure is followed by four suggested mirror reflections of it. Assuming that the mirror is placed to the right of the figure (except in questions 7, 11 and 12), pick out the correct reflected figure.

Key Figure:

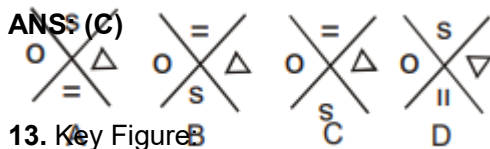


Answer Figure:



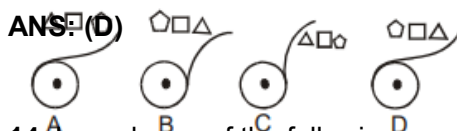
12. Key Figure:

Answer Figure:



13. Key Figure:

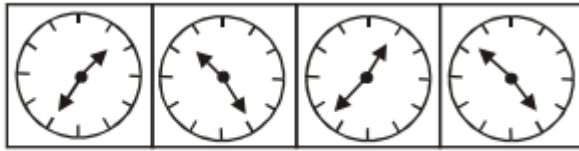
Answer Figure:



14. In each one of the following questions, choose the correct mirror image of the figure 'X' from amongst the form alternatives a,b,c,d given along with it.



(X)



A

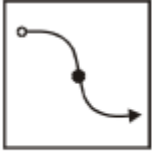
B

C

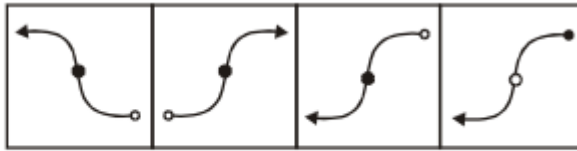
D

ANS: (D)

15.



(X)



A

B

C

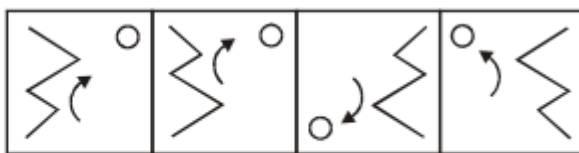
D

ANS: (C)

16.



(X)



A

B

C

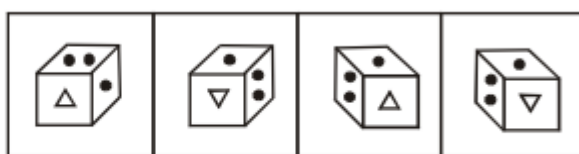
D

ANS: (C)

17.



(X)



A

B

C

D

ANS: (C)

18. Various terms of an alphabet series are given with one or more terms missing. Select the missing terms from the choices. AZ, GT, MN, ?, YB.

- A) kf
- B) rx
- C) sh
- D) ts

ANS: (C)

**19.** Poles: Magnet::? : Battery?

- A) Energy
- B) Power
- C) Terminals
- D) Cells

**ANS: (C)**

**20.** The various terms of an alpha-numerical series have been given with one or more terms missing. Choose the missing terms from the choices. A/2, B/4, C/6, D/8?

- A) E/8, F/10
- B) E/12, F/14
- C) E/10, F/12
- D) D/10, E/10

**ANS: (C)**

**21.** What is the compound interest on a sum of ₹40,000 for 33 years at the rate of 11% per annum?

- A) ₹14444.25
- B) ₹14706.26
- C) ₹14322.10
- D) ₹14705.24

**ANS: (D)**

**22.** 16384, 8192, 2048, 256, 16,?, 16384, 8192, 2048, 256,16,?

- A) 11
- B) 22
- C) 0.5
- D) 0.7

**ANS: (C)**

**23.** Kamal pointed to a photograph and says. "The lady in the photograph is my nephew's maternal grandmother." How is the lady in the picture related to the Kamla's sister if he has no sister of his own?

- A) Mother-in-law
- B) Cousin
- C) Sister-in-law
- D) Mother

**ANS: (D)**

**24.** An accurate clock shows 8 am. Through how many degrees will the hour hand rotate when the clock shows 2 pm?

- A) 154°
- B) 172
- C) 180°
- D) 160°

**ANS: (C)**



**25.** Kushal and Maya started a business by investing Rs. 36,000 and RS. 63,000. Find the share of each, out of the annual profit of Rs. 5500.

- A) Rs. 3500, Rs. 2500
- B) Rs. 2500, Rs. 3500
- C) Rs.4000, Rs. 3500
- D) Rs.2000, Rs. 3500

**ANS: (D)**

# AVIATION AFFAIRS

1. ----- is India's first indigenous aircraft trainer.

- A. HANSA-New Generation (HANSA-NG)
- B. Cessna-152
- C. Diamond DA40
- D. Cessna Skyhawk 172

**ANS: (A)**

2. National Aerospace Laboratories were established in -----?

- A) 1970
- B) 1930
- C) 1959
- D) 1946

**ANS: (C)**

3. World largest airplane built by Stratolaunch has ----- of configuration?

- A) Single fuselage
- B) Twin-fuselage
- C) Monocoque
- D) Semi-monocoque

**ANS: (B)**

4. World's first hydrogen aircraft will be launched by-----?

- A) 2030
- B) 2039
- C) 2025
- D) 2035

**ANS: (D)**

5. India had concluded an Inter-Governmental Agreement (IGA) with France for the purchase of how many Rafale fighter jets?

- A) 32
- B) 34
- C) 36
- D) 30

**ANS: (C)**

6. Rafale fighter jet has been built by

- A) Dassault Aviation
- B) Canada
- C) Russia
- D) German Company

**ANS: (A)**

7. Harpoon missiles and torpedo missiles are compatible with which Indian aircraft?

- A) Tejas
- B) Mig-21
- C) C-172 aircrafts
- D) p-81 aircrafts

**ANS: (D)**

8. Government of India has opened which portal for drone registrations?

- A) Digital Sky
- B) Digi yatra
- C) UDAN
- D) Drone in India

**ANS: (A)**

9. Who is the Current (2022) Defence Minister in India?

- A) Arun Jetley
- B) Rajnath Singh
- C) Rakesh Kumar Bhaduria
- D) Manohar Parikkar

**ANS: (B)**

10. Who is first Indian Defence Minister to fly in Indigenous aircraft "Tejas"?

- A) Rajnath Singh
- B) Arun Jetley
- C) N Tiwari
- D) Anil Chauhan

**ANS: (A)**

11. IAF has dealt with which Indian company for production of Tejas aircraft?

- A) NAL
- B) DRDO
- C) Saffron
- D) HAL Pt. Ltd.

**ANS: (D)**

12. Who becomes India's First Female Fighter Pilot to qualify to take combat missions?

- A) Bhawana Kanth
- B) Gunjan Saxena
- C) Mohana Singh
- D) None of the above

**ANS: (A)**

13. India's first private sector unit for manufacturing Unmanned Aerial Vehicles (UAVs) has recently opened at---  
-----?

- A) Gujarat
- B) Chennai
- C) Hyderabad

D) Bangalore  
**ANS: (C)**

14. The Indian Air Force has successfully carried out the first-ever mid-air refuelling of the indigenously build fighter aircraft Tejas MK 1 with an

- A) IL-78 MKI tanker
  - B) IL- tanker
  - C) IL-8 MKI tanker
  - D) IL-71 MKI tanker
- ANS: (D)**

15. SARAS PT1N plane developed by

- A) National Aeronautics Laboratories (NAL)
  - B) National Defence Academy
  - C) Council of Scientific Study and Indian Research
  - D) Hindustan Aeronautics Pt. Ltd.
- ANS: (A)**

16. VTOL Stands for-

- A) Versatile Touch-down And Longerons
  - B) Vertical Type and Longerons
  - C) Vertical Touch-down And Landing
  - D) Vertical Take-off And Landing
- ANS: (D)**

17. The DGCA is the regulatory body for civil aviation under the Ministry of Civil Aviation and is headquartered at?

- A) New Delhi
  - B) Hyderabad
  - C) Chennai
  - D) Gujarat
- ANS: (A)**

18. India's first weaponised chopper?

- A) Chinook
  - B) Rudra
  - C) Tejas
  - D) Cheetah
- ANS: (B)**

19. The S-400 air defence missile systems will be delivered to India by which country?

- A) Israel
  - B) Russia
  - C) USA
  - D) Finland
- ANS: (B)**

**20. Ajeya Warrior's** the joint military exercise conducted between India and which country?

- A) United Kingdom
- B) Japan
- C) France
- D) Israel

**ANS: (A)**

**21.** Tigersharks squadron, which was seen in news for test-fire of BrahMos supersonic cruise missile, is based in which state?

- A) Kolkata
- B) Chennai
- C) Hyderabad
- D) Tamil Nadu

**ANS: (D)**

**22.** BrahMos Aerospace is a joint venture company set up by Russia's Mashinostroyeniya and which other company of India?

- A) DRDO
- B) BHEL
- C) NAL
- D) ISRO

**ANS: (A)**

**23.** Which start-up has partnered with NewSpace India Limited (NSIL) to launch India's private Remote-sensing satellite?

- A) Agnikul
- B) Bellatrix Aerospace
- C) Pixxel
- D) Vesta Space

**ANS: (C)**

**24.** Which Defence force has proposed to acquire 12 high-performance patrol boats?

- A) Indian Navy
- B) Indian Army
- C) Indian Coast Guard
- D) Indian Air Force

**ANS: (B)**

**25.** Which Indian city is the venue of the Global Air show 'Aero India'?

- A) Vishakhapatnam
- B) Cochin
- C) Chennai
- D) Bangalore

**ANS: (D)**

# COURSES

- **B.Tech Aerospace engineering**
- **B.Tech Aeronautical engineering**
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- **Aircraft Maintenance Engineering (AME) + B.sc (Aeronautics)**
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